

**WHAT IS CLAIMED IS:**

1. A system for providing a VPN (Virtual Private Network) service by connecting a VPN to a mobile communication network, comprising:
  - 5 a home agent (HA) for storing location information of a mobile node (MN) and information on whether the MN is registered in the VPN service;
  - a foreign agent (FA) for transmitting a location registration request message to the HA by receiving location registration information of the MN, and transmitting data to an ISP (Internet Service Provider) router in a same subnet
  - 10 upon receiving a VPN service request;
  - a server for providing the VPN service; and
  - a router network for connecting the VPN server to the FA.
2. The system as claimed in claim 1, wherein the router network
  - 15 includes a server for searching an edge Internet Protocol (IP) router in the network using an address of the FA.
3. The system as claimed in claim 1, wherein the HA prevents the MN from accepting a call request received from a specific node in an IP network
  - 20 while the MN is performing the VPN service.
4. A system for providing a Virtual Private Network(VPN) service by connecting a VPN to a mobile communication network, comprising:
  - an home agent(HA) for storing location information of an mobile
  - 25 node(MN) and information on whether the MN is registered in the VPN service;
  - an foreign agent(FA) for transmitting a location registration request message to the HA by receiving location registration information of the MN, transmitting data to an Internet Service Provider(ISP) router in a same subnet upon receipt of a VPN service request, and performing Internet Protocol(IP)
  - 30 communication with a specific subscriber;

the MN for performing the Internet Protocol(IP) communication with the FA, the MN being registerable in the VPN;

a server for providing the VPN service; and

a router network for connecting the VPN server to the FA, and  
 5 performing a data service with the MN through the IP communication with the FA.

5. The system as claimed in claim 4, wherein the router network includes a server for searching an edge IP router in the network using an address  
 10 of the FA.

6. The system as claimed in claim 4, wherein the HA prevents the MN from accepting a call request received from a specific node in an IP network while the MN is performing the VPN service.

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7. The system as claimed in claim 4, wherein the MN transmits an address of the HA and an address of the VPN server to the FA during VPN registration, and performs the VPN service by receiving a temporary ID for use of the VPN from the FA during the location registration.

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8. The system as claimed in claim 7, wherein the MN stores an address of the VPN server and an address of a router in the network, received from the FA, and performs the VPN service using the received addresses.

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9. A method for providing a Virtual Private Network (VPN) service to a mobile node(MN) located in a foreign agent (FA) area connected to the MN, comprising the steps of:

upon receiving a location registration request message for the VPN service from an FA, storing an address of the FA connected to the MN;

30 transmitting a location registration request signal to a requested VPN

server; and

upon receiving a reply signal in response to the location registration request signal, blocking an Internet service and transitioning to a VPN service state.

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10. The method as claimed in claim 9, further comprising the step of transmitting a location registration failure message for the VPN service upon failure to receive the reply signal within a predetermined time after transmitting the location registration request signal.

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11. A method for providing a Virtual Private Network(VPN) service to an mobile node(MN) located in a foreign agent (FA) area connected to the MN, comprising the steps of:

upon receiving a location registration request signal for the VPN service  
15 from the MN, storing an address of the home agent (HA) and an address of the VPN, and transmitting a location registration request message to the HA by analyzing the address of the HA;

upon receiving a location registration authentication signal from the HA,  
storing an address of a router in an Internet Protocol (IP) network connected to a  
20 VPN server;

transmitting a location registration reply message to the MN that has transmitted the location registration request signal for the VPN service; and

upon receiving a VPN service request from the MN, controlling a service process.

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12. The method as claimed in claim 11, wherein the step of controlling the service process comprises the steps of:

upon receiving a VPN service request, transmitting a service request signal to an IP network router of the FA; and

30 upon receiving a service reply signal from the IP network router,

determining whether the VPN service is available; and

forming, if the VPN service is available, a channel to the MN and performing the VPN service.

5           13.     A method for providing a Virtual Private Network(VPN) service in an mobile node(MN), comprising the steps of:

              upon receiving a VPN service request, creating a location registration request signal for the VPN service, the signal including an address of a HA and an address of a VPN server, and transmitting the created location registration  
10 request signal for the VPN service;

              upon receiving a location registration reply signal for the VPN service, determining whether a VPN-ID is included in the received location registration reply signal for the VPN service; and

              if the VPN-ID is included in the received location registration reply  
15 signal for the VPN service, storing theVPN-ID, and upon receiving the VPN service request, establishing a channel using the VPN-ID and exchanging data and a voice signal through the channel.

              14.     A method for providing a Virtual Private Network (VPN) service  
20 in a mobile node (MN) having a mobile IP at a VPN server, the method comprising the steps of:

              upon receiving a VPN service availability confirm signal from a foreign agent (FA) to which the MN belongs, checking both whether the MN is in condition of registration or not and whether VPN service is available or not;

25           storing a FA address in which the MN is located if the MN is registered and VPN service is available;

              creating VPN service availability message for transmitting the MN and transmitting the created message to the FA.

30           15. The method as claimed in claim 14, further comprising the step of;

activating a timer for the purpose of placing a time restriction in storing the FA address; and

upon completion of timer activation, deleting the FA address.

- 5           16. A method for providing a Virtual Private Network (VPN) service in a home agent (HA) including a mobile node (MN) having a mobile IP, the MN is available for VPN service, the method comprising the steps of:

upon receiving a VPN registration request signal, storing a foreign agent (FA) address in which the MN is located and creating a service availability  
10 inquiry message from a Internet Service Provider (ISP) router connected to a VPN server to transmit the created message; and

upon receiving a VPN service availability confirm signal from the ISP router, creating the VPN service availability message in accordance with the received VPN service availability confirm signal and transmitting the created  
15 message.

17. The method as claimed in claim 16, wherein the VPN service availability inquiry message includes data of the MN and the FA address.

- 20           18. The method as claimed in claim 16, further comprising the step of activating a time for a predetermined time period in case that VPN service is available and performing a VPN service mode.